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AUTHOR Duchastel, Philippe C.
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ABSTRACT

To establish the joint effects of the orienting factors of structure, learning objectives, and time on the recall of the content of a prose passage, an experiment involving 108 college students was conducted. The study combined two levels of structure (ideationally high and ideationally low) with three conditions of objectives (ideationally high, other objectives, and no objectives) and with two study time conditions (10 and 15 minutes). The learning materials consisted of two scientific prose passages, each 500 words long. Various measures of learning were derived from a free-recall test immediately following the treatments. The results offer support for the selective attention hypothesis which is usually advanced in relation to the orienting role of objectives. They further revealed that time had little effect on this orienting role. With respect to structure, the findings support the theory that the prominence of ideas does lead to better recall of these ideas. Structure, however, was found to lose its effect when objectives were present. Thus there were no joint effects of objectives and structure. (Copies, in French, of the passages with their instructions and objectives, the free-recall test, the strategy questionnaire, and the protocol correction form used in the experiment are appended.) (Author/FL)

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LEARNING OBJECTIVES AND THE ORGANIZATION OF PROSE

Philippe C. Duchastel

1977

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UNIVERSITE DE FRIBOURG
DIVISION DE PSYCHOLOGIE EXPERIMENTALE ET PÉDAGOGIQUE

UNIVERSITÄT FRIBOURG
FACHBEREICH EXPERIMENTELLE UND PÄDAGOGISCHE PSYCHOLOGIE (FEPP)

UNIVERSITY OF FRIBOURG
EXPERIMENTAL AND EDUCATIONAL PSYCHOLOGY DIVISION

PLACE DU COLLEGE 21, CH-1700 FRIBOURG/SWITZERLAND

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ZUSAMMENFASSUNG: Lehrziele und Textorganisation

Es konnte vielfach nachgewiesen werden, dass Lehrziele das Lernen zu leiten, auszurichten vermögen; meistens steigern sie das sogenannte relevante Lernen und mitteln sie das sogenannte inzidentelle Lernen. Ein zweiter Orientierungsfaktor des Lernens ist gegeben durch die perzipierte Bedeutung einzelner Informationsteile innerhalb eines Textes, im speziellen durch ihre Position innerhalb der semantischen Struktur des Textes. Im hier beschriebenen Experiment wurden diese beiden Orientierungsfaktoren von einander unabhängig variiert, um festzustellen, ob ihre Effekte additiv sind oder ob sie gegenseitig interagieren. Es wurde sogar eine dritte Variable eingeschlossen, nämlich die Lernzeit, damit sichtbar würde, ob Zeitbeschränkung die beiden erstgenannten Faktoren ihrerseits beeinflussen würde.

Die Variablen wiesen folgende Ausprägungsgrade auf: hohe versus schwache Bedeutung jeweiliger Textelemente, Ziele von hoher Bedeutung versus wenig bedeutungsvolle Ziele versus Lernen ohne Lehrziele, zehn versus fünfzehn Minuten Lernzeit. Das Experiment wurde durchgeführt mit Gymnasiasten. Das Lernmaterial bestand in einem wissenschaftlichen Text von etwa fünfhundert Wörtern. Der Lernerfolg wurde mit einem Test für freie Wiedergabe des Gelernten unmittelbar nach dem Lerndurchgang erhoben; er wurde auf verschiedenen Skalen gemessen.

Die Ergebnisse bestätigten zunächst den Befund, dass Lehrziele eine selektive Aufmerksamkeit verursachen. Die Lernzeitvariation hatte wenig Effekt auf diese Wirkung. Bezüglich der semantischen Struktur bestätigen die Ergebnisse den Befund von Meyer (1975), wonach bedeutsame, zentrale Ideen leichter und häufiger wiedergegeben werden als weniger bedeutsame. Auch diese Wirkung wurde durch die Zeitvariation wenig betroffen.

Andererseits aber verlor die Variable der semantischen Struktur ihre Bedeutung, wenn Lehrziele vorgegeben waren. Die Effekte der beiden Orientierungsfaktoren waren demnach nicht additiv. Dieser

Befund wurde interpretiert als bedingt durch die sehr starke Wirkung von Lehrzielen, der gegenüber die Wirkung der semantischen Strukturvariablen unbedeutend geworden war.

SUMMARY: Learning Objectives and the Organization of Prose

Instructional objectives are well known as orienting factors in learning, ie they usually increase relevant learning and decrease incidental learning. Another orienting factor which is thought to affect learning is the ideational prominence of certain ideas in a text in relation to other ideas, ie the position of ideas within the overall semantic structure of the text. The experiment reported here jointly manipulated these two orienting factors to establish whether their respective effects would be additive or whether the factors would interact in a non-additive manner. A third variable, time, was also included in the study in order to examine its potential role as a constraint which could differentially affect the respective roles played by the two orienting factors in learning.

The study combined two levels of structure (ideationally high/ ideationally low)with three conditions of objectives (ideationally high objectives/other objectives/ no objectives) and with two study time conditions (10 and 15 minutes). The study was performed with college level students. The learning materials consisted of a scientific prose passage, some 500 words long. Various measures of learning were derived from a free-recall test administered immediately following the treatments.

The results offer further support for the selective attention hypothesis which is usually advanced in relation to the orienting role of objective. They also revealed that time had little effect on this orienting role. With respect to structure, the results replicate Meyer's (1975) previous finding that ideational prominence of ideas does lead to better recall of these ideas and further indicate that this structural effect was similar in both time conditions used in the experiment.

Structure, however, was found to lose its effect when objectives were present in the learning situation. The joint effects of the two orienting factors were therefore not additive. This was interpreted as being largely due to the strong role played by objectives in relation to the role played by structure in learning.

RESUME: Les Objectifs d'Apprentissage en Relation avec la Structuration d'un Texte

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Les objectifs d'apprentissage sont déjà connus pour le rôle d'orientation qu'ils peuvent jouer en situation d'aquisition des connaissances. Un second facteur d'orientation dans l'apprentissage est l'importance perçue des divers éléments d'information dans un texte, c'est-à-dire leur position relative dans la structure sémantique d'un texte. L'expérience décrite dans ce rapport voulut examiner les eifets conjoints de ces deux facteurs d'orientation afin de constater si leurs effets respectifs seraient indépendants et additifs ou si au contraire ils agiraient de façon interactive. Une troisième variable manipulée dans l'expérience fut le temps accordé pour étudier le texte, cela à cause du rôle potentiel que pouvait jouer ce facteur (en tant que contrainte) en relation aux rôles respectifs des deux facteurs d'orientation.

L'expérience combina donc deux niveaux de structure (importance élevée des éléments/importance faible), trois conditions de présentation des objectifs (objectifs d'importance élevée/autres objectifs/pas d'objectifs) et deux temps d'étude (soit 10 minutes, soit 15). Le matériel était un texte de teneur scientifique d'un peu plus de 500 mots. L'expérience fut effectuée avec des étudiantes de niveau collégial. Diverses mesures d'apprentissage furent obtenues à partir d'un test de rappel libre qui suivit immédiatement l'étude du texte.

Les résultats sont conformes à l'hypothèse d'attention sélective qui sert habituellement à expliquer le rôle d'orientation des objectifs d'apprentissage. Ils révèlent également que la contrainte de temps, tel qu'utilisée dans l'expérience, eut peu d'effet sur ce rôle

d'orientation. Quant au rôle joué par la structure du texte, les résultats obtenus sont conformes à l'hypothèse de Meyer (1975) selon lequel l'importance perçue des éléments d'un texte influence le rappel de ces éléments. Ils indiquent également que l'effet de structure ne fut pas attenué par le facteur temps.

Le potentiel d'orientation de la structure du texte perdit cependant sa force lorsque le texte fut accompagné d'objectifs. Les effets conjoints de ces deux facteurs d'orientation ne sont donc pas additifs. Ces résultats sont interprétés comme résultant largement du rôle très fort joué par les objectifs en situation d'apprentissage par rapport au rôle d'orientation pouvant être joué par la structure d'un texte.

LEARNING OBJECTIVES AND THE ORGANIZATION OF PROSE

After reading a text or learning the content of a short passage of prose, why is it that some ideas are better recalled than others ? Recall of ideas will naturally vary from one person to another, but on the whole some of the ideas contained in the text are recalled with more frequency than others. For instance, main ideas may be recalled better than secondary ideas, or unusual ideas more than common ones. The research described here is aimed at exploring some aspects of this question.

It is well known that students studying for an exam will concentrate on different ideas in a text to a different degree, depending on the nature of the exam. For instance, if they expect only multiple choice questions, they may concentrate on factual information in the text, whereas an open-question exam may lead to study activity oriented to the main points of the text. Thus, expectations with respect to performance will have an orienting effect on their learning activity.

Other factors will also influence the relative importance they accord to certain elements of the text. One of these is the inherent salience of certain ideas in relation to the others. Usually, some ideas are judged more "central" than others and this will depend upon the structure of the text, ie how the ideas are interrelated among themselves in the text. Yet another factor influencing judged importance of text elements is the orientation provided by directions. Thus learning objectives accompanying a text will often direct the student's learning activity. The study presented here investigated experimentally the joint effects of these latter two factors, structure and learning objectives, upon recall of the content of a prose passage.

Philippe C. Duchastel
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The context of the research

As one expected way of facilitating learning, instructional objectives have received a good deal of research attention over the past few years. The use of objectives in an instructional situation indicate to the learner what he is expected to be able to do after his study activity; they indicate what the teacher expects of him or what he himself should expect as a result of learning.

An early review of the literature with respect to objectives (Duchastel and Merrill, 1973) clearly showed that providing the learner with instructional objectives could indeed facilitate learning. This review covered some 20-odd research studies, which however greatly varied in their results:

objectives sometimes helped learning, but not always. There were clearly other factors at play which influenced the facilitative role of objectives.

Later research went more deeply into the problem and examined how objectives influence different types of learning. With some exceptions, this body of research confirmed a selective attention hypothesis, whereby objectives increase relevant learning (learning of text elements which are related to the objectives) and decrease incidental learning (elements not related to the objectives (eg Duchastel and Brown, 1974; Gagné and Rothkopf, 1975; Rothkopf and Billington, 1975). These results concur with expectation and also with a sound pedagogical view regarding the proper use of objectives in instruction.

Another development was a growing interest in how objectives interact with text characteristics in their influence on learning. Thus, Rothkopf and his associates studied the interaction of objectives with the density of the information in a text (Rothkopf and Kaplan, 1972; Kaplan and Rothkopf, 1974), and with the dispersion of information in a text (Gagné and Rothkopf, 1975).

An important study with respect to the interaction between objectives and text elements is the one which was conducted by Duell (1974). Her results supported the hypothesis that the judged importance of a text element determines whether objectives will facilitate learning or not: if the learner judges an element to be important, he will learn it whether or not it is related to an objective; with less important elements, though, he will be influenced by whether or not there is an objective related to them.

Turning now to the research on structural characteristics of text and their influence on learning, the situation is much less clear. Apart from early research on the sequencing of programmed instruction content and a number of studies with very constrained prose (eg Frase, 1969, among others), structure has been a rather recent variable to be investigated with meaningful learning materials like prose. An early study by Lee (1965) as well as a more recent one by Filby (1974) point out the difficulty in relating structure to learning because of the complexity of this variable.

This difficulty has been largely due to the problem of analysing a text in order to operationalise the structure of its elements. Meyer (1975) reviews a number of attempts to solve this problem in an adequate manner (eg Crothers, 1973; Fredericken, 1973) and proposes herself an effective procedure for analysing the organization of prose. While not all these attempts led to supporting the hypothesis of a positive structural effect on learning, Meyer's own research is strongly indicative of the potentiality in this area.

Basing herself on recent work in linguistics (especially Grimes, 1972), Meyer developed a procedure which depicts the hierarchical relationships between the elements in a text in terms of their ideational prominence. Ideational prominence of an element refers of its relative position within the overall content structure of the text. For instance, a superordinate element is positioned higher up in the structure of a text than is its subordinate

elements.

With her procedure, she analysed and constructed a number of short texts and by experimentally varying the ideational prominence of the same topic within distinct texts, she was able to support her hypothesis that the location of information within the content structure of a text does indeed affect learning, in terms of which information units are recalled more often than others.

The present study took off from there and investigated how this structural effect interacts with the now well-known effect of objectives on learning. If learning activity is presumed to be oriented (at least in part) both by the structural characteristics of a text and by any instructional objectives accompanying the text, the question of their joint effects was felt to be of substantial interest. Indeed, two distinct orienting factors which are at play in a learning situation may either work in the same direction to enhance learning more than either of them alone, or, alternatively, they may oppose each other and, through this mutual interference, impede learning. The particular result obtained would likely depend on the nature of the orienting factors and how these are combined with each other in the learning task.

The experiment presented here explored this question by jointly varying different levels of the two orienting factors indicated above, thus examining the effects of various combinations of these factors within the learning situation. Because the question being examined is extremely complex, especially if we take into account Rothkopf's conclusions, this study can be considered as an exploratory one, without a firm set of hypotheses to be confirmed or disproved.

An additional variable which was brought into the experiment was study time. While this addition further complicates the issue, it could on the other hand prove to be of great interest inasmuch as orienting factors are likely to differ in their effects, depending

on the time pressures imposed on learning. What were investigated, then, were the joint effects of structure, learning objectives and time.

METHOD

Subjects and Design

One hundred and thirteen subjects participated in this study although the data from five of them were discarded from the analyses for lack of task motivation as evidenced in the protocols. The subjects were all female students in the years 5 and 6 (equivalent to 11 and 12 years of full-time schooling) at the Collège Ste-Croix in Fribourg.[1] Their average age was 17 in the fifth year and 18 in the sixth. They served in a 3 x 2 x 2 experimental treatment layout as follows: 3 conditions of objectives, 2 structure conditions, 2 time conditions, with 9 subjects in each cell.

Materials

The learning materials were two passages on energy developed by Meyer (1975) and used in her study of text organization. Each passage contains five paragraphs and each is a little more than 500 words in length. They were translated into French by the present author. The two passages appear in Appendix A.

The first passage is entitled "Les Reacteurs Surgénérateurs" and treats the following topics:

a) Future electrical needs
b) Rational utilization of fossil fuels
c) Breeder reactors
d) The process of nuclear breeding
e) The principle of doubling time

The second passage, entitled "Nos Sources d'Energie Futures", treats the following topics:

a) Emerging alternative energy sources

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[1] I wish to thank Mr. Noel Ruffieux who very kindly made the necessary arrangements for the experiment, as well as his colleagues at the Collège who gave me access to their classes.

b) Solar energy
c) Breeder reactors
d) Geothermal resources
e) Laser fusion

It will be noticed in the two lists of topics above that one of the topics is treated in each one of the two passages (topic c in each list), although in a different context. This is what constitutes the content structure manipulation in this experiment; what is varied is the ideational prominence of this topic in relation to the other topics in each passage. In the first passage, this topic (called the target topic) is placed high in the content structure of the text (preceding more detailed treatment of nuclear fission). In the second passage, on the other hand, this same target topic is placed low in the content structure of the text (merely one of four energy sources). A more detailed (and numerical) description of this level of placement of the target topic can be found in Meyer (1975).

For our purpose, it will suffice to remember that the same target topic (identical word for word in each passage) is structurally more salient (more "ideationally prominent") in the first passage than in the second one.

Learning Objectives

Nine learning objectives were developed for each of the two passages. They state what the learner should be able to do after studying the text. An example of the objectives used is the following: " (to be able to ...) ... give three reasons for which breeder reactors are seen as attractive sources of energy". The entire set of objectives used can be seen in the cover sheets contained in Appendix A.

The manipulation of this variable in the experiment led to three distinct treatments (which were then crossed with the two structure conditions and the two time conditions). The first treatment consisted of six objectives, three of which were related to the target topic and the other three to other parts of the texts. The second

treatment consisted of six objectives, none of which were related to the target topic. Finally, the third treatment consisted of no objectives at all and served as a control condition.

Since the two passages differed in content, except for the target paragraph which they both shared, the subjects received different objectives depending not only on which "objectives" treatment group they were in, but also on which text they received (ie on which "structure" condition they were assigned). The entire set of objectives employed can be classified into five distinct subsets of three objectives each: subset C, which related to the target topic; subsets A and B, each related to other parts of the Sources of Energy passage; and subsets D and E, related to other parts of the Breeder Reactors passage. All subjects in the experimental groups received six objectives. The specific subsets of objectives received in each treatment group are presented in Figure 1.

OBJECTIVES

STRUCTURE	Target objectives presented	Target objectives not presented	No Objectives presented
Target topic placed high (Breeder Reactors passage)	Subsets C E	Subsets D E	-
Target topic placed low (Sources of Energy passage)	Subsets C A	Subsets B A	-

Figure 1. Subsets of objectives received in each treatment group.

This classification of objectives into subsets was not apparent to the subjects participating in the study. Rather it was used in correcting the free recall protocols and as a basis for statistical comparisons both between groups and between the subsets of objectives themselves where appropriate. The mapping of the objectives onto the two passages in terms of dispersion within the passages and density (cf Rothkopf and Kaplan, 1972) was approximately uniform across groups.

Procedure

The subjects participated in the study during regular class hours in groups of approximately twenty. The materials were distributed randomly to the subjects in each of the six sessions. The set of materials received by each subject were assembled in a brown manila envelope and contained the following: (i) instructions and objectives (but only instructions for the control groups); (ii) one of the two passages; (iii) a free-recall post-test; and (iv) a questionnaire on study strategy.

For half of the subjects, the instructions indicated that study time would be ten minutes. For the other half, they indicated fifteen minutes. The instructions also asked the subjects not to take written notes and introduced the accompanying learning objectives as statements of what the author of the passage hoped they would remember after studying the passage. Finally, they also indicated the nature of the post-test. The detailed wording of these instructions can be seen in Appendix A.

After ten minutes of study time, the experimenter interrupted the group to direct those subjects in the ten-minute condition to go on to the post-test. The same was done after fifteen minutes for the others. All subjects had ample time to complete the free-recall test, after which they filled in the strategy questionnaire. Each session lasted approximately forty-five minutes.

Dependent Measures

The free-recall post-test requested the subject to recall as much as she could of the passage she had just studied. The strategy questionnaire contained two questions: one aimed at ascertaining general reading strategy, the other at ascertaining the use made of the learning objectives provided. Only the experimental groups received this last question. Each question asked the subject to select, among four or five alternative strategies, the one which was closest to the one she had used in studying the passage. Both the post-test form and the questionnaire appear in Appendix A.

The free-recall protocols were corrected by the experimenter using a protocol sheet which contained the 23 elements of the target topic and the five subsets of objectives described previously (cf Appendix A). Protocol correction was performed in a blind manner, ie the experimenter did not know which group a given subject was in while correcting her protocol.

One point was given for each objective which was mastered, as judged from the protocols. Thus the maximum score for each subset of objectives was three. Correction standards were very lenient to compensate for the difficulty of the test, as compared to a test composed of a set of specific questions where the questions themselves serve as hints for recall.

The target topic was corrected using the 23 elements developed by Meyer (1975) through her method of text representation. Meyer's analysis actually led to 24 elements, but since one of them was present in one of the objectives used in this study, it was dropped from the scoring of the protocols so as not to unduly favour the groups which received this objective. Here also, the scoring was somewhat lenient (although more controlled) with all forms of paraphrase being accepted. One point was given for each one of the 23 elements present in a protocol.

RESULTS AND DISCUSSION

Analyses

Since all subjects in the experiment did not receive the same passage to study (depending on which structure condition they were in), the statistical analyses presented below were performed with an N of 108 or an N of 54 according to the dependent measure used, with nine subjects in each cell throughout.

All subjects had received the target topic, thus all subjects had a target topic score as well as a score for the content related to objective C. These two scores are different measures of learning resulting from the same paragraph and indeed their correlation is .85. As indicated previously, the target topic score is based on Meyer's protocol analysis procedure with a maximum of 23 points, and thus it is a more precise index of learning than the score for objective C is. This latter score though is useful when examining incidental and relevant learning in relation to the scores for the other objectives in the experiment.

A 3-way fixed-effects analysis of variance was performed on the target topic scores, with structure, objectives and time as the factors. This analysis revealed the following significant effects:

- objectives	$F(2,96) = 16.7$, $p < .001$
- time	$F(1,96) = 7.7$, $p < .01$
- objectives x time	$F(2,96) = 3.6$, $p < .05$

The means of the groups involved in this analysis are presented in Appendix B. Various simple effects analyses (contrasts between various sub-groups) were also conducted and are discussed below.

A similar 3-way ANOVA was also performed on the scores for objective C, with this time only the effects of objectives and objectives x time being significant (at the same levels of probability as above).

Four 2-way analyses of variance were performed on each of the sets of scores for the other objectives (Objectives A,B,D,E),with objectives and time as the factors. These analyses were done with 54 subjects each since only those subjects which received the Breeder Reactor passage could learn content related to objectives D and E; likewise, only those with the Future Energy Sources passage could obtain a score for objectives A and B.

All four analyses revealed a significant effect for the objectives factor with probabilities less than.001 for the score on objective D and less than .05 for the others. Contrasts between groups are discussed below. The means for respective groups are presented in Appendix B.

With respect to the strategies reported by the subjects on the strategy questionnaire, the small N in each cell which would result from the fractionation of the subjects on these two variables precluded an examination of their interactive effects with other variables. However, their relative frequencies within various groups of the independent variables were examined through chi-square analyses and these relationships are discussed below.

Specific results

It seems appropriate to first examine the effects of the orienting factors independently and then to look at their joint effects. While significant interactions sometimes affect the interpretation of main effects, the main effects can often provide an indication of the relative strength which the variable played in the experiment.

Structure

Thus the role played by structure in this experiment appears to be a rather weak one. The fact that very little of the variance in the target topic scores is attributed to structure or its potential interactions with the other independent variables (none of these reaching an acceptable significance level) is indicative of this. It would appear instead that objectives played the major orienting role in the particular learning situation involved in this experiment.

This view is reinforced by an examination of the results obtained in the control groups with respect to the structure variable. In these groups, structure could affect learning by itself since no objectives accompanied the passages. These groups were also of a priori interest since they replicate the conditions of Meyer's experiment. A simple effect analysis on the target topic scores with times combined, revealed a significant difference ($F = 4.6$; df: 1,35; $p. < .05$) favouring the group in which the target topic appeared high (mean recall: 10.1) over the group in which it appeared low (mean recall: 7.1). This effect did not interact with time, nor was it apparent on the less discriminating measure for objective C.

Objectives

The effects of objectives were very important in this study, as evidenced by the statistical significance of this variable on all dependent measures. The means of the 3 conditions of this variable on the target topic scores combined over structure and time, were as follows:

- group with target objectives and 3 others : 11.2
- group with all non-target objectives : 5.5
- group with no objectives : 8.6

These means were all significantly different from each other (at. .05 or better), a result which was also replicated with the scores for objective C. Thus, as expected, those subjects which received the set of objectives labelled C (relevant to the target topic) recalled the target topic better than did those without any objectives; those subjects which received a completely different set of objectives (unrelated to the target topic) recalled that topic even less well than those without objectives. This result is not surprising in itself, but it does lend further support to the selective attention hypothesis derived from previous research on objectives. It should be noted here that, in this study, objectives interacted with time, as discussed below. However, the interaction is not a disordinal one and the pattern of results is similar in both time conditions.

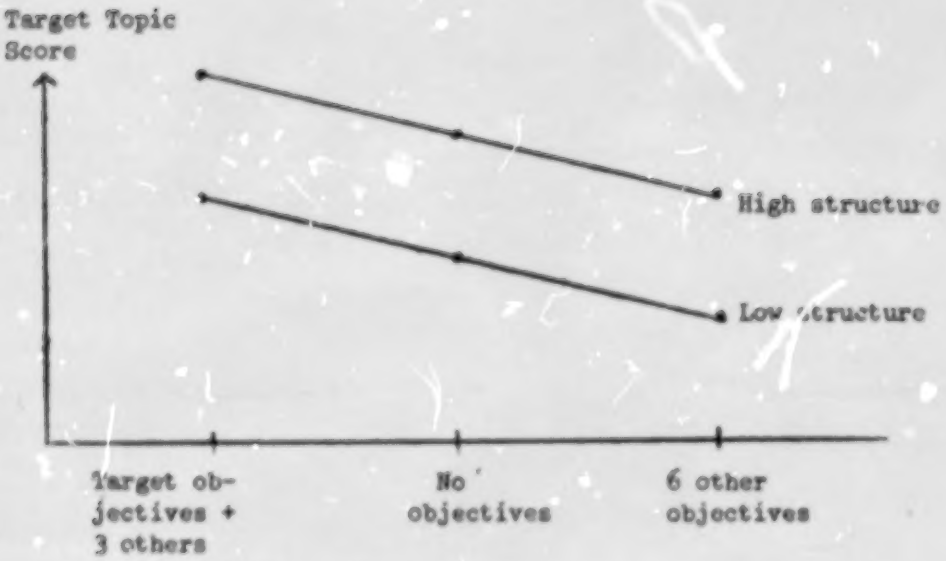
The results with respect to the sets of objectives A, B, D and E also generally conform to the selective attention hypothesis, although with exceptions. Subjects receiving, for instance, set B of objectives with their passage generally perform better on these objectives than the control groups without objectives; the control groups in turn perform better on these objectives than subjects provided with other objectives, for instance, objective C. There were a number of multiple comparisons involved here, two-thirds of which were significant and the others not. Thus, the orienting effect of objectives was somewhat less evident here than with the target topic scores, although still generally present.

Time

Time, as expected, had a significant effect on learning of the target topic ($F = 7.7$; df: 1.96; $p < .01$) although not on either of the scores for the various sets of objectives, perhaps because of the lesser sensitivity of these measures. The groups which enjoyed fifteen minutes of study time increased their target topic recall scores by 10 % over those which had only ten minutes in which to study the passage (respective means of 9.6 and 7.3).

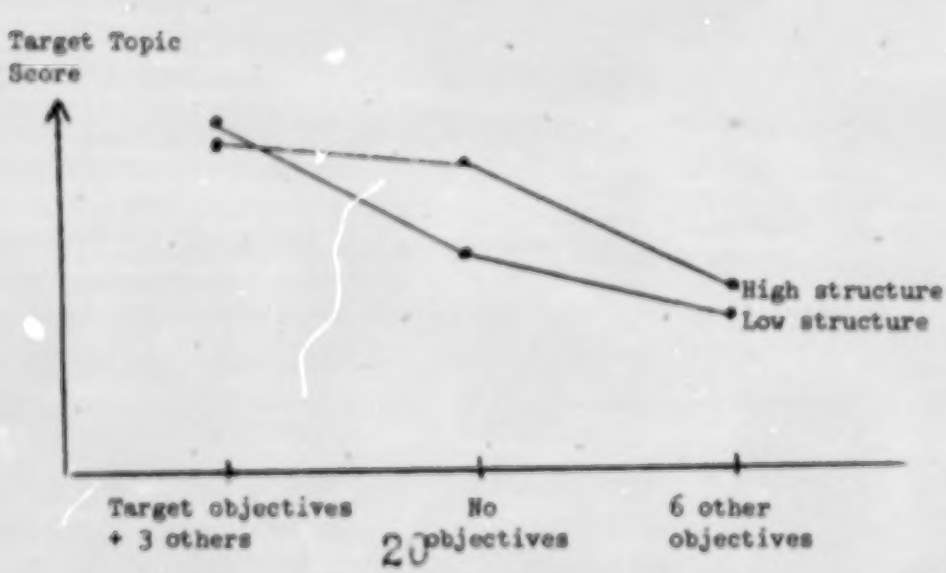
Interactions

A structure x objectives interaction was not especially expected in the present study, nor was one obtained statistically. Indeed, the effects of both orienting factors were expected to be pretty much additive with the highest target topic scores being obtained in the "high content structure and target objectives" condition, and the lowest scores being obtained in the "low content structure with other than target objectives " condition. Schematically, these expectations appear as follows:



Thus, the two slopes being identical, the effects represented in the schema would be fully additive.

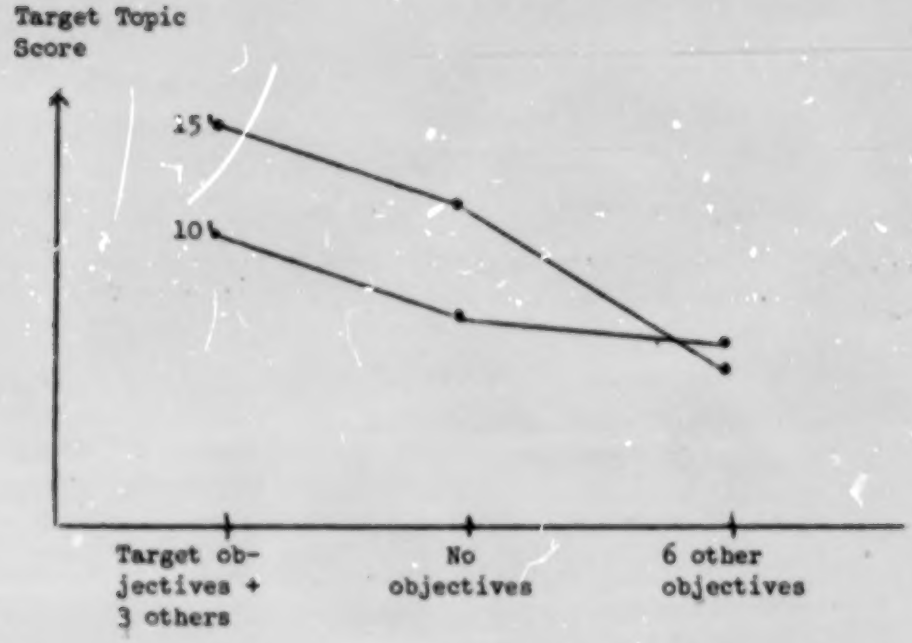
While no structure x objectives interaction was obtained in the study, the data nevertheless do not fully conform to the expectations presented in the schema above, mainly because structure did not affect learning in a significant way (except in the control condition). The data obtained are represented schematically as follows:



It is essential to note that since neither the main effect for structure nor the interaction effect is significant, these data remain statistically unreliable and the joint additive effect hypothesis cannot be supported by the data. Indeed, a greater distance between the two slopes would have been needed for that, as in the expectation schema above.

It is interesting to note, however, that while no statistical interaction effect was obtained, conceptually there does seem to be an interaction present in the situation: it is only in the groups where the objectives orienting factor accompanies the structure orienting factor (in the two conditions where objectives accompanied the passages) that structure loses its power to increase learning. Indeed, the structure orienting factor, when acting by itself (as when the passages were unaccompanied by objectives) did significantly increase learning, as discussed previously. The fact that structure lost its effect, so to speak, when objectives appeared on the scene is probably due to the overpowering role played by objectives in this experiment in relation to the role played by structure itself. Objectives, in other words, appear to be a much stronger orienting factor in a learning situation than the structure of the text itself.

Turning now to the objectives x time interaction, which was statistically significant on both the target topic score and the score for objective C, the role of time in this experiment should be explained. The potential importance of time was primarily that it could act as a constraint on text processing in the ten minutes condition, thereby differentially affecting the role played by the two orienting factors being examined, depending on the time available for study. At first, time does seem to have differentially affected the role played by objectives, as indicated by the interaction which is depicted in the following schema representing the target topic scores:



The interaction effect, though, is solely due to the groups which received six objectives of which none were the target objectives. Their target topic scores are very similar, which is quite understandable since any extra study time would have presumably been devoted to their own objectives, which were not target objectives. The scores for these respective sets of objectives (A and B; D and E) were, however, not sensitive enough to pick up this presumed increase.

Nevertheless, when leaving these groups aside, the interaction disappears: an increase in study time has a similar effect on learning whether objectives are provided or not, as evidenced by the similar slopes in the first half of the schema. The objectives x time interaction then must not mislead us to think that the time constraint did affect the orientation of learning in this study. As with the objectives x structure situation, a distinction between statistical interaction and situational interaction is necessary.

As for an overall structure x time interaction, the analysis revealed that there was none. It is also interesting to note this lack of interaction in the case of the control groups, which received the passages unaccompanied by objectives (a simple effects ANOVA with the control groups only revealed no significant interaction). Thus

the structure effect present in this case, as described previously, is little affected by the time conditions in this experiment (although with more severe time constraints, the structure effect is likely to show more variance).

Strategies

The strategy questionnaire was included in the experiment in order to obtain some idea of how the subjects actually processed the passages and objectives they received. While the measures themselves are very rough ones indeed, they nevertheless serve their purpose, even if only in an exploratory sense. The first question was related to the subject's general reading strategy whereas the second one more directly concerned text processing with respect to the objectives received.

It was of interest to see whether the frequencies of reported strategy would vary from group to group depending on the nature of the treatments. The relevant data are presented in Appendix B. With respect to general reading strategy, very few subjects chose option C (straightforward multiple readings of the passage) and the others were divided approximately equally between option A and option B (A: quick read followed by a more detailed one; B: detailed reading from the start). Tests of chi-square between reported strategy and the independent variables (structure, objectives, time) were performed, but no significant differences in order of choices were revealed by these analyses. Thus, variability of treatment had little effect on general reading strategy.

With respect to the subjects' reported use of objectives, the choices were somewhat less evenly distributed, with approximately a third of the subjects choosing option A (read the objectives, then the text, then went back to the objectives) but only a fifth choosing option B (directly focused one's reading around the objectives); the other two options showed intermediate frequencies (option C, little attention paid to the objectives: somewhat over a fifth; option D, attempted learning all but with special attention

given to the objectives: a quarter of the subjects). Tests of chi-square, however, revealed no significant differences in order of choices as a function of the experimental treatments.

Generally then, either the treatments did not affect in an important manner the study strategies adopted (which, however, is not to say that they did not affect learning) or the questionnaire used was not precise or sensitive enough to reveal an influence.

Conclusions

The strongest effect revealed in this experiment was undoubtedly the effect or objectives on learning. This finding lends further support to the view that objectives influence learning through a process of selective attention: an increase in relevant learning can indeed only be interpreted in these terms. As noted in the introduction, this view also concords well with a sound pedagogical approach to the use of objectives in teaching.

A novel aspect of the problem which was explored in the current study was the question of how time (especially in the form of a constraint, although not a severe one) might affect the orienting role of objectives. The findings with respect to this issue lead to the conclusion that this orienting role is little affected by time. In other words, objectives are robust orienting factors. A note of caution is in order, however: this conclusion is derived from findings where the time conditions were not severely constraining (ten minutes still being a good deal of time to study a 500-word passage). With greater differences in time or a more constrained situation it is possible that time would affect the orientation provided by objectives.

With respect to structure, the findings would seemingly lead us to believe that this orienting factor played a rather weak role in the study. This, however, would not constitute a fully adequate interpretation of the data, for the contrast between levels of structure in the control groups revealed the presence of a structure effect. Thus structure, by itself, does orient learning.

The present study, then, offers further support to Meyer's (1975) hypothesis that ideational prominence of ideas in a prose passage will partly determine which ideas are later recalled and which are not. This support is especially significant when we consider that the passages used were French translations of the original passages.

A further finding of interest in this respect was the fact that this structural effect was hardly affected by the differences in time which were used in the study. Structure and time were found to be pretty much additive, ie structure similarly increased learning in either time condition. The same note of caution as above, however, is also applicable here: under other conditions, time could quite possibly influence the orienting role of structure.

If, however, high structure was effective in increasing learning when the subjects studied the passages by themselves (as the control subjects did) it lost this effect when the passages were accompanied by learning objectives. Thus there were no joint effects of objectives and structure. Nor, however, was there an interactive effect of objectives x structure (none was especially expected).

The interpretation which seems to best fit the results obtained in this study is that the orienting effect of structure is overpowered by the much stronger orienting effect of objectives. This interpretation, it should be noted, is the opposite of Duell's interpretation in her own study (1978). In that study, structure won out on objectives whereas here the reverse is true. Why this is so is not immediately apparent. One possibility lies in the nature of the materials: learning materials in experiments investigating the effects of orienting factors always attempt to strike an adequate balance between the apparent force of these factors; however, whether this balance is achieved or not in practice is another questions. Are we then simply dealing with different levels of balance, or is there more to it than that ? The question remains an open one, awaiting further exploration.

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APPENDIX A

1. The learning materials used in the experiment.

2. The instructions and objectives accompanying the passages.

3. The free-recall test, the strategy questionnaire and the protocol correction form.

LES REACTEURS SURGENERATEURS

Le besoin de produire des quantités énormes de puissance additionnelle en électricité et en même temps de protéger l'environnement constitue l'un des problèmes sociaux et technologiques majeurs que la société devra résoudre dans les deux ou trois prochaines décades. La Commission Fédérale de l'Energie estime que durant les 30 prochaines années, l'industrie américaine de l'énergie devra ajouter quelque 1,600 millions de kilowatts à sa capacité actuelle de puissance qui est de 300 millions de kilowatts. Quant à l'environnement, le souci actuel d'améliorer la qualité de l'air, de l'eau et du paysage n'a presque pas besoin d'élaboration, sauf pour un point qui est souvent oublié : ça va prendre de grandes quantités d'énergie électrique pour faire fonctionner les nombreux types d'usines de purification qui seront nécessaires pour nettoyer l'air et l'eau et pour recycler les déchets.

Un autre problème d'égale grandeur est l'utilisation rationnelle de nos réserves limitées de charbon, d'huile et de gaz. Eventuellement, ils seront beaucoup plus précieux comme sources de molécules organiques que comme sources de chaleur. De plus, toute réduction dans la consommation de combustibles organiques amène une réduction proportionnelle dans la pollution de l'air qui provient de la combustion de ces produits.

Le type de réacteur nucléaire dit surgénérateur semble être une solution très prometteuse à ces problèmes. Les réacteurs surgénérateurs produisent plus de combustible nucléaire qu'ils n'ent consomment ; ils rendraient possible l'utilisation de quantités énormes de minéraux en teneur faible d'uranium et de thorium qui se trouvent dispersés dans les roches de la terre comme une source d'énergie peu coûteuse pour des milliers d'années. En surplus, ces réacteurs fonctionneraient sans ajouter de produits nocifs de combustion dans l'air. Ce sont ces considérations qui poussèrent la Commission de l'Energie Atomique, l'industrie nucléaire et l'industrie électrique à entreprendre un effort d'envergure pour développer la technologie qui permettrait à un réacteur surgénérateur de produire de la puissance électrique sur une échelle commerciale d'ici 1984.

La propagation nucléaire est réalisée par le déclenchement de neutrons au moyen de la fission nucléaire. La fission de chaque atome d'un combustible nucléaire, tel que l'uranium 235, libère en moyenne plus de deux neutrons rapides à haute énergie. L'un des neutrons doit déclencher une autre fission pour maintenir la réaction nucléaire à chaîne ; certains neutrons sont perdus sans rien produire, et les autres sont disponibles pour générer de nouveaux atomes fissiles, c'est-à-dire pour transformer les isotopes "fertiles" des éléments lourds en isotopes fissiles. Les matériaux bruts fertiles pour les réactions à chaîne sont le thorium 232, qui est transformé en uranium 233, et l'uranium 238, qui est transformé en plutonium 239.

Il fût déjà mentionné que la surgénération se produit quand plus de matériel fissile est produit qu'il n'y en a de consommé. Une mesure quantitative de cette condition est le temps de doublement : le temps nécessaire pour produire autant de matériel fissile additionnel qu'il n'y en avait initialement dans le réacteur. Au bout du temps de doublement, le réacteur a produit assez de matériel fissile pour servir de carburant à lui-même et pour servir de carburant à un autre réacteur identique. Un réacteur surgénérateur efficace aura un temps de doublement variant entre sept et dix ans.

NOS SOURCES D'ENERGIE FUTURES

Quoique l'on donne aujourd'hui beaucoup de publicité aux gens qui proclament une crise de l'énergie et un désastre qui en résulterait dû aux carences futures de combustibles, la situation quant à l'énergie n'apparaît pas si mauvaise. Des sources d'énergie différentes commencent à prendre place à côté des combustibles traditionnels qui furent jusqu'ici la source principale d'énergie de la nation. Ces différentes sources d'énergie sont l'énergie solaire, l'énergie nucléaire, l'énergie géothermique et l'énergie provenant de lasers.

L'énergie solaire consiste à transformer la radiation du soleil en chaleur, en électricité ou en combustibles chimiques. D'ici cinq ans, des systèmes pour chauffer et climatiser les maisons, qui sont basés sur l'énergie solaire seront disponibles dans le commerce à des prix qui seront compétitifs avec les fournaises à l'huile ou au gaz, et avec les climatiseurs électriques. Dans le futur, il sera peut-être possible économiquement de transformer la radiation solaire directement en électricité au moyen de cellules photovoltaïques ou au moyen de bio-conversion en bois, en méthane ou en d'autres combustibles chimiques.

Les réacteurs nucléaires qui furent développés pour produire de l'énergie nucléaire comprennent les réacteurs hétérogènes à l'uranium enrichi, les réacteurs à l'eau chaude, les réacteurs homogènes et les réacteurs surgénérateurs. Le réacteur à uranium naturel de type Calder Hall fût le premier, en Angleterre, à produire de la puissance électrique sur une base commerciale. Aux Etats-Unis, c'est un réacteur à uranium enrichi qui fût le premier à produire des quantités importantes d'électricité. Les réacteurs surgénérateurs produisent plus de combustible nucléaire qu'ils n'ent consomment ; ils rendraient possible l'utilisation de quantités énormes de minéraux en teneur faible d'uranium et de thorium qui se trouvent dispersés dans les roches de la terre comme une source d'énergie peu coûteuse pour des milliers d'années. En surplus, ces réacteurs fonctionneraient sans ajouter de produits nocifs de combustion dans l'air. Ce sont ces considérations qui poussèrent la Commission de l'Energie Atomique, l'industrie nucléaire et l'industrie électrique à entreprendre un effort d'envergure pour développer la technologie qui permettrait à un réacteur surgénérateur de produire de la puissance électrique sur une échelle commerciale d'ici 1984.

Plusieurs savants croient que les ressources géothermiques de la terre sont grandes et qu'elles peuvent être utilisées assez facilement. Ces ressources comprennent la vapeur, l'eau chaude et le roc chaud. De la vapeur de la région de Lardarello, en Italie, fût utilisée pour produire de l'électricité depuis 1904. Aux Etats-Unis, la seule ressource géothermique en usage commercial est le champ de vapeur des Geysers au nord de San Francisco. Malheureusement, les puits géothermiques tels ceux des Geysers produisent autant de polluants de l'air que les combustibles traditionnels. On estime que 100,000 megawatts de puissance pourraient provenir de ressources géothermiques d'ici la fin du siècle.

Une dernière source d'énergie potentielle pourrait provenir de la fusion de lasers. Le soleil produit son énergie par la fusion d'hydrogène. Des lasers venant de diverses directions peuvent chauffer un grain d'hydrogène pour déclencher une réaction de fusion. La recherche sur les lasers est croissante, comme le montrent les demandes de fonds toujours plus importantes dans le budget national : la demande de fonds pour 1975 était de 13 millions de dollars alors que celle de 1976 était de 23 millions. Cette recherche, en plus de pousser plus loin la recherche de sources d'énergie différentes, portera fruit en fournissant les besoins d'énergie de la nation dans le futur.

DIRECTIVES

Votre tâche dans cette expérience de psychologie est d'étudier le texte assez court qui se trouve sur la page suivante et par la suite de prendre un test sur le contenu du texte. S'il vous plaît, n'écrivez pas sur le texte lui-même et ne prenez aucune note écrite non plus.

Vous avez 15 minutes* pour étudier le texte, après quoi vous aurez à prendre un test. Le test vous demandera simplement d'écrire en vos propres mots tout ce dont vous pourrez vous souvenir du contenu du texte.

* ou "10 minutes" pour les autres groupes !

DIRECTIVES

Votre tâche dans cette expérience de psychologie est d'étudier le texte assez court qui se trouve sur la page suivante et par la suite de prendre un test sur le contenu du texte. S'il vous plaît, n'écrivez pas sur le texte lui-même et ne prenez aucune note écrite non plus.

Vous avez 15 minutes pour étudier le texte, après quoi vous aurez à prendre un test. Le test vous demandera simplement d'écrire en vos propres mots tout ce dont vous pourrez vous souvenir du contenu du texte.

Les objectifs d'apprentissage qui vous sont donnés ci-bas devraient vous aider à apprendre le contenu du texte. Ils représentent ce que l'auteur du texte espère que vous puissiez retenir après avoir étudié le texte. Lisez-les d'abord puis par la suite il s'agira de vous y référer au besoin en étudiant le texte.

- -

Objectifs d'apprentissage

Après que vous aurez étudié le texte, l'on s'attendra à ce que vous puissiez tout particulièrement .....

(E)* ... indiquer un aspect du problème de l'énergie qui est parfois négligé par le public concerné par l'environnement.

(E) ... donner deux raisons pour lesquelles les combustibles organiques tels le charbon, l'huile, et le gaz ne sont pas vus comme ressources d'énergie à long terme.

(C) ... donner trois raisons pour lesquelles les réacteurs surgénérateurs sont attrayants comme source d'énergie.

(C) ... décrire la situation actuelle quant à la recherche visant à rendre les réacteurs surgénérateurs commercialement viables.

(C) ... indiquer quand cela doit arriver.

(E) ... expliquer ce que signifie le temps de doublement.

* Ces lettres indiquant les sous-ensembles des objectives, ne figuraient pas sur les instructions distribuées aux sujets !

DIRECTIVES

Votre tâche dans cette expérience de psychologie est d'étudier le texte assez court qui se trouve sur la page suivante et par la suite de prendre un test sur le contenu du texte. S'il vous plaît, n'écrivez pas sur le texte lui-même et ne prenez aucune note écrite non plus.

Vous avez 15 minutes pour étudier le texte, après quoi vous aurez à prendre un test. Le test vous demandera simplement d'écrire en vos propres mots tout ce dont vous pourrez vous souvenir du contenu du texte.

Les objectifs d'apprentissage qui vous sont donnés ci-bas devraient vous aider à apprendre le contenu du texte. Ils représentent ce que l'auteur du texte espère que vous puissiez retenir après avoir étudié le texte. Lisez-les d'abord puis par la suite il s'agira de vous y référer au besoin en étudiant le texte.

- -

Objectifs d'apprentissage

Après que vous aurez étudié le texte, l'on s'attendra à ce que vous puissiez tout particulièrement ...

(A) ... expliquer l'état de situation actuel quant à l'énergie.

(A) ... indiquer dans combien de temps les systèmes à énergie solaire deviendront compétitifs sur le marché.

(C) ... donner trois raisons pour lesquelles les réacteurs surgénérateurs sont attrayants comme source d'énergie.

(C) ... décrire la situation actuelle quant à la recherche visant à rendre les réacteurs surgénérateurs commercialement viables.

(C) ... indiquer quand cela doit arriver.

(A) ... indiquer l'inconvénient des puits géothermiques.

DIRECTIVES

Votre tâche dans cette expérience de psychologie est d'étudier le texte assez court qui se trouve sur la page suivante et par la suite de prendre un test sur le contenu du texte. S'il vous plaît, n'écrivez pas sur le texte lui-même et ne prenez aucune note écrite non plus.

Vous avez 15 minutes pour étudier le texte, après quoi vous aurez à prendre un test. Le test vous demandera simplement d'écrire en vos propres mots tout ce dont vous pourrez vous souvenir du contenu du texte.

Les objectifs d'apprentissage qui vous sont donnés ci-bas devraient vous aider à apprendre le contenu du texte. Ils représentent ce que l'auteur du texte espère que vous puissiez retenir après avoir étudié le texte. Lisez-les d'abord puis par la suite il s'agira de vous y référer au besoin en étudiant le texte.

Objectifs d'apprentissage

Après que vous aurez étudié le texte, l'on s'attendra à ce que vous puissiez tout particulièrement ...

(A) ... expliquer l'état de situation actuel quant à l'énergie.

(A) ... indiquer dans combien de temps les systèmes à énergie solaire deviendront compétitifs sur le marché.

(B) ... indiquer quel état le premier réacteur nucléaire à produire de l'électricité sur une base commerciale.

(A) ... indiquer l'inconvénient des puits géothermiques.

(B) ... expliquer comment se produit la fusion au moyen de lasers.

(B) ... indiquer la croissance actuelle dans la recherche sur la fusion par lasers.

DIRECTIVES

Votre tâche dans cette expérience de paychologie est d'étudier le texte assez court qui se trouve sur la page suivante et par la suite de prendre un test sur le contenu du texte. S'il vous plaît, n'écrivez pas sur le texte lui-même et ne prenez aucune note écrite non plus.

Vous avez 10 minutes pour étudier le texte, après quoi vous aurez à prendre un test. Le test vous demandera simplement d'écrire en vos propres mots tout ce dont vous pourrez vous souvenir du contenu du texte.

Les objectifs d'apprentissage qui vous sont donnés ci-bas devraient vous aider à apprendre le contenu du texte. Ils représentent ce que l'auteur du texte espère que vous puissiez retenir après avoir étudié le texte. Lisez-les d'abord puis par la suite il s'agira de vous y référer au besoin en étudiant le texte.

Objectifs d'apprentissage

Après avoir étudié le texte, l'on s'attendra à ce que vous puissiez tout particulièrement...

(D) ... donner une indication des besoins futurs en électricité.

(E) ... indiquer un aspect du problème de l'énergie qui est parfois négligé par le public concerné par l'environnement.

(E) ... donner deux raisons pour lesquelles les combustibles organiques tels le charbon, l'huile, le gaz ne sont pas vus comme ressources d'énergie à long terme.

(D) ... indiquer quels deux isotopes fertiles sont utilisés dans les réacteurs surgénérateurs.

(E) ... expliquer ce que signifie le temps de doublement.

(D) ... indiquer le temps de doublement d'un réacteur surgénérateur efficace.

TEST

Ecrivez ci-dessous tout ce dont vous pouvez vous rappeler du texte que vous venez de lire. Utilisez vos propres termes si vous voulez, mais n'indiquez pas tout simplement des idées uniquement au moyen de mots-clés; plutôt, exprimez-vous toujours en phrases complètes. Quand vous aurez terminé, insérez le test dans l'enveloppe et prenez le questionnaire.

Continuez au verso au besoin.

QUESTIONNAIRE SUR L'EXPERIENCE

Nous aimerions savoir comment vous avez étudié le texte que vous avez reçu.

---

1. Dans les quatre options ci-bas, indiquez laquelle est la plus semblable à la manière que vous avez utilisée pour étudier le texte.

A. J'ai d'abord lu le texte assez rapidement pour saisir les points principaux, puis j'ai relu de façon plus approfondie.
B. J'ai lu le texte très soigneusement pour en apprendre le contenu de façon approfondie, puis (le temps permettant) j'ai relu certaines parties pour les approfondir davantage.
C. J'ai simplement lu le texte autant de fois que le temps le permettait.
D. Autre manière. S'il vous plaît, indiquez comment vous avez procédé:

---

2. Relatif aux objectifs d'apprentissage. Dans les cinq options ci-dessous, indiquez laquelle (ou lesquelles) est (sont) la plus semblable (les plus semblables) à votre façon de procéder.

A. J'ai regardé les objectifs, puis j'ai lu le texte de façon assez générale, puis j'ai approfondi les parties du texte relatives aux objectifs.
B. Après avoir regardé les objectifs, j'ai tout de suite essayé de repérer et d'approfondir les parties du texte qui y étaient relatives.
C. Je me suis préoccupé assez peu des objectifs, essayant plutôt d'apprendre tout ce que contenait le texte.
D. En étudiant le texte, j'ai surtout essayé d'approfondir les parties relatives aux objectifs, mais j'ai aussi essayé d'apprendre le reste.
E. Autre manière. S.V.p., indiquez la stratégie que vous avez adoptée:

PROTOCOLE GROUPE: TEMPS: SUJET: STRATEGIES: _____

PARAGRAPHE	OBJECTIFS	
Surgénérateurs	Etat actuel	
Produisent	Energie solaire compétitif	A
Combustible	Inconvénient puits géoth.	
Plus que consommant		
Utilisation	Réacteur Calder Hall	
Quantités énormes	Expliquer fusion lasers	B
Uranium en faible teneur	Croissance recherches lasers	
Thorium en faible teneur		
Dispersés dans roches	3 raisons réacteurs surgén.	
Energie peu coûteuse	Recherche actuelle surg. viable	C
Des milliers d'années	1984	
Fonctionnairaient		
Sans produits nocifs	Besoins futurs en électricité	
Dans l'air	2 isotopes fertiles	D
Commission de l'Energie A.	T. de D. de réacteur efficace	
L'industrie nucléaire		
L'industrie électrique	Aspect négligé	
Entreprendre en effort	2 raisons / charbon, huile, gaz	E
D'envergure	Expliquer T. de D.	
Surgénérateur		
Produire		
Puissance électrique		
1984		

APPENDIX B

The means of the various dependent measures used in the experiment.

TARGET TOPIC SCORES

	TARGET OBJS	6 OTHER OBJS	No OBJS	
HIGH STRUCTURE	9.0	7.0	8.1	10 min.
	12.8	4.8	12.1	15 min.
LOW STRUCTURE	9.6	4.8	5.3	10 min.
	13.4	5.3	8.9	15 min.

SCORES FOR SET "C" OF OBJECTIVES

	TARGET OBJS	6 OTHER OBJS	No OBJS	
HIGH STRUCTURE	1.6	1.0	0.7	10 min.
	2.1	0.6	1.9	15 min.
LOW STRUCTURE	1.8	0.7	0.7	10 min.
	1.8	0.4	1.1	15 min.

SCORES FOR OBJECTIVES "D"

	TARGET OBJS	6 OTHER OBJS	No OBJS	
HIGH	0.7	2.2	2.0	10 min.
STRUCTURE	1.0	2.3	1.7	15 min.

SCORES FOR OBJECTIVES "E"

	TARGET OBJS	6 OTHER OBJS	No OBJS	
HIGH	2.9	2.7	1.7	10 min.
STRUCTURE	2.1	2.7	2.4	15 min.

SCORES FOR OBJECTIVES "A"

	TARGET OBJS	6 OTHER OBJS	No OBJS	
LOW	2.9	2.6	2.1	10 min.
STRUCTURE	2.7	2.7	2.3	15 min.

SCORES FOR OBJECTIVES "B"

	TARGET OBJS	6 OTHER OBJS	No OBJS	
LOW	0.9	1.7	1.8	10 min.
STRUCTURE	1.4	2.6	1.9	15 min.

FREQUENCIES OF STRATEGIES - QUESTION 1

(IN THE ORDER A,B,C)

	TARGET O B J S	6 OTHER O B J S	No O B J S	
HIGH STRUCTURE	2 , 7 , 0	2 , 7 , 0	7 , 2 , 0	10 min.
	6 , 2 , 1	5 , 4 , 0	3 , 5 , 0	15 min.
LOW STRUCTURE	3 , 4 , 0	3 , 4 , 2	4 , 5 , 0	10 min.
	4 , 5 , 0	5 , 3 , 1	5 , 4 , 0	15 min.

FREQUENCIES OF STRATEGIES - QUESTION 2

(IN THE ORDER A,B,C,D)

	TARGET O B J S	6 OTHER O B J S	No O B J S	
HIGH STRUCTURE	1, 2, 3, 3	2, 2, 1, 4	- - -	10 min.
	4, 1, 2, 2	7, 2, 0, 0	- - -	15 min.
	1, 3, 2, 3	3, 1, 2, 3	- - -	10 min.
STRUCTURE	2, 1, 3, 3	3, 2, 3, 0	- - -	15 min.